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UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

COREPHOTONICS, LTD.
 	
                    Plaintiff,
 	
vs.
 	
APPLE INC.
 	
                    Defendant.
	Case No. 3:17-cv-06457-JD (Lead Case)
	Case No. 3:18-cv-02555-JD
	
	COREPHOTONICS, LTD.'S OPENING CLAIM CONSTRUCTION BRIEF

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I.   INTRODUCTION

The parties dispute seven terms across the two patents-in-suit. Corephotonics' proposed constructions correctly track the actual language defining the terms in the specification, and they are faithful to the patentee's description of the invention. By contrast, Apple's proposed constructions diverge from the language in the claims and specification and modify it, by either importing limitations from merely exemplary embodiments or selectively ignoring the patents' disclosure. As shown below, Apple's proposals deviate from the intrinsic record and do not fit within the context of the claimed invention or even within the context of the claims themselves. Accordingly, Corephotonics' proposed constructions should be adopted.

II.   BACKGROUND OF THE ASSERTED PATENTS

The Asserted Patents[1] relate to Corephotonics' innovative miniature zoom camera technology for mobile devices, such as smartphones. By way of background, a camera lens has an associated focal length, which corresponds to the power of the lens to resolve objects at a distance from the camera. A camera lens with a larger focal length resolves images at a greater distance with a narrower field of view, the angular width of what can be seen through the camera. In the prior art, zoom was performed optically, by physically moving lens elements in a camera relative to each other to increase or decrease the focal length. Optically "zooming in" to resolve images at farther distances from the camera entails increasing the focal length of the camera lens, and "zooming out" requires decreasing the focal length. While a mechanical zoom solution worked for portable digital cameras, it requires a camera assembly that is too large, as well as more expensive and less reliable than the fixed focal lengths that are generally used in mobile phones. *See* '291 pat. 1:39-42. Alternatively, digital zoom solutions process the image to crop and scale it to create the appearance of zoom. However, digital zoom reduces resolution and deteriorates image quality, unless the camera also includes thick optics or large, expensive sensors. '291 pat., 1:43-48.

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[1] The patents-in-suit are U.S. Patent Nos. 9,185,291 (the "'291 patent") and 9,568,712 (the "'712 patent") (collectively, the "Asserted Patents").

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1   Corephotonics developed an innovative dual-aperture fixed-focal length lens camera

2   technology for optical zoom that can fit in a mobile device and provide superior performance to

3   the prior art. Corephotonics' technology combines one wider camera that smartphones typically

4   use, along with a second, tele camera with a higher focal length and narrower field of view. The

5   dual-camera system thereby enables optical zoom. At the heart of Corephotonics' innovation and

6   the Asserted Patents are solutions to the practical obstacles to making the zoom dual camera

7   approach work, including both hardware innovations, like those claimed in the '712 patent, and

8   image processing innovations, like those claimed in the '291 patent.

9   ### A.   The '291 Patent

10   The '291 patent is directed to thin dual-lens digital cameras with optical zoom, which

11   operate in both video and still mode. '291 pat., 3:14-24. The '291 patent generally describes

12   technology that uses image fusion to combine the images from the two cameras with different

13   fields of view ("FOV")—which the patent refers to with coined terms "Wide" and "Tele"—for

14   still pictures, but does not use image fusion for video. In particular, the '291 patent discloses

15   processing for the "still camera mode," which includes capturing synchronous images from both

16   the Wide and Tele cameras, and fusing the Wide and Tele images "to achieve optical zoom." *Id.*

17   at 7:25-39. In continuous video mode, the '291 patent discloses digitally zooming either the Wide

18   camera image or Tele camera image, depending on the level of zoom. For example, when zooming

19   in, the video output will be from the Wide camera, up to a point at which the output will switch to

20   being from the Tele camera. *Id.*, 10:30-34.

21   The '291 patent discloses the acquisition of single zoom images that combine image data

22   from the Tele and Wide cameras in the still camera mode. *Id.*, 9:15-43. The Wide and Tele cameras

23   will be at separate positions on a device, as shown in Fig. 1B of the '291 patent. Because the

24   cameras are at different spatial positions, the Wide and Tele cameras take images seen from

25   different points of view (POV). *Id.*, 4:60-5:2. The patent further discloses how the camera

26   controller in still mode can provide a fused output image from the point of view of the Tele camera

27   at higher levels of zoom, a fused output image from the point of view of the Wide camera at lower

28   levels of zoom, and transition between those while zooming in and out. *Id.*, 9:52-10:10.

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1   During video zoom, *i.e.*, when the camera is being zoomed in and out while a video is being

2   displayed, the zoom operation switches between Wide and Tele cameras. *Id.*, 10:56-11:5. The '291

3   patent teaches that while displaying video, if the zoom operation switches "between sub-cameras

4   or points of view, a user will normally see a 'jump' (discontinuous change)." *Id.*, 10:13-17. The

5   '291 patent addresses this problem by providing a video zoom with a "smooth transition" during

6   this switchover, which the '291 patent defines "a transition between cameras or POVs that

7   minimizes the jump effect." *Id.*, 10:17-19. The '291 patent goes on to teach methods for achieving

8   a smooth transition in video zoom mode, including position matching, to address the different

9   spatial perspectives and viewing angles of each camera, as well as matching scale, brightness, and

10   color. *Id.*, 10:19-27 *et seq*.

11   **B.   The '712 Patent**

12   The '712 patent is directed to providing a miniature telephoto lens assembly usable in

13   mobile devices, such as smartphones. *See, e.g.*, '712 pat., 1:18-22. In particular, the '712 patent is

14   directed to providing a compact lens assembly with a small total track length (TTL) and small ratio

15   of TTL to the effective focal length (EFL) of the lens assembly. *Id.*, 1:25-41, 1:62-2:2. The total

16   track length (TTL) determines the physical length of the camera, so a small TTL results in a

17   smaller, more compact camera. The effective focal length (EFL) determines how well the camera

18   performs at capturing images of small or distant objects. A lens with a greater EFL is able to

19   capture images of such objects with greater detail. All asserted claims of the '712 patent require

20   that the TTL be smaller than the EFL. This provides a telephoto lens assembly that can be utilized

21   in a thin dual camera optical zoom system suitable for smartphones. The '712 patent claims relate

22   to different lens parameters that yield a system with a TTL smaller than the EFL, along with other

23   optical properties.

III.   AGREED CONSTRUCTIONS

25   The parties agree on the constructions of the following terms.

Asserted Claims	Term or Phrase	Agreed Construction
'291 patent cl. 6 '712 patent, cls. 1, 15, 19	"total track length (TTL)" / "total length (TTL)" / "(TTL)"	the length of the optical axis spacing between the object-side surface of the first lens element and one of: an electronic sensor, film,

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		and an image plane corresponding to either the electronic sensor or a film sensor
'712 patent, cl. 15	"optical power"	refractive power
'712 patent, cls. 1, 15	"effective focal length (EFL)" / "EFL"	the focal length of a lens assembly
'291 patent, cls. 1, 12	"smooth transition"	a transition between cameras or points of view that minimizes the jump effect

IV.   DISPUTED CLAIM TERMS

A.   "Wide" ('291 patent, claims 1, 2, 4, 5, 10, 12, 13)

Corephotonics' Proposed Construction	Apple's Proposed Construction
"Wide" refers to one of a pair of imaging sections with a wider field of view	No construction necessary. If the Court determines that construction is necessary, Apple would propose that "Wide" means "wide-angle," or, alternatively, "wide-angle, characterized by an effective focal length (EFL) shorter than normal and field of view (FOV) wider than normal."

The '291 patent's use of the term "Wide" is inextricably linked to its use of a parallel term: "Tele." As shown in claim 1, "Wide" and "Tele" are terms used by the patentee to refer to and denote two separate groups of components as well as individual components in those two separate groups. Despite a superficial similarity upon which Apple seeks to capitalize, "Wide" and "Tele" *are not* terms used in the '291 patent to respectively refer specifically to a "wide angle lens" or "telephoto lens" (or to impose some sort of requirement unique to lenses). This is made clear in both the specification and the patent claims themselves, in addition to the fact that the words "Wide" and "Tele" were capitalized by the patentees to identify them as proper adjectives instead of generic terms. For example, the '291 patent specifically states, in the context of the prior art, that the descriptors "Wide" and "Tele" refer to *sensors* which are used to produce images with relatively differing fields of view and output resolutions:

> One sensor is commonly called "Wide" and the other "Tele". Each sensor provides a separate image, referred to respectively as "Wide" (or "W") and "Tele" (or "T") images. A W-image reflects a wider FOV and has lower resolution than the T-image.

'291 patent, at 2:10-14.

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1   This approach—of describing dual-aperture imaging systems where imaging sections

2   differ *relative* to one another rather than in absolute terms with respect to fields of view or total-

3   track-length-to-focal-length (TTL/EFL) ratios—is also commonly used in the prior art cited by

4   '291 patent. Declaration of John C. Hart ¶ 31-32. For example, U.S. Patent App. Pub.

5   2010/0277619 to Scarff ("Scarff"), which is cited at 2:3 of the '291 patent, is directed to a dual-

6   aperture imaging system described as follows:

> The camera 10 may include a first lens 12 having a ***relatively-shorter focal
> length*** and a first sensor 14 that are located proximate to and substantially
> aligned with a second lens 16 having a ***relatively-longer focal length*** and a
> second sensor 18. By having the combined first lens and first sensor aligned with
> the combined second lens and second sensor, the sensors can each obtain an
> image of substantially the same subject. Of course, due to the different focal
> lengths of the lenses 12 and 16, the first sensor 14 will obtain an image of the
> subject with a ***relatively-wider field of view (FOV)*** as compared to ***the
> relatively-narrower FOV*** of the image obtained by the second sensor 18.

Scarff (Ex. 5), at [0012].[2]

13   This approach is plainly the one taken by the inventors of the '291 patent. Hart Decl. ¶ 33.

14 The specification consistently uses the words "Wide" and "Tele" as adjective denoting

15 membership in or relationship to a specific group of components, and not as a limiter necessarily

16 imposing some sort of "wide angle" or "telephoto" requirement. For example, the '291 patent

17 describes:

> a zoom digital camera comprising a Wide imaging section that includes a fixed
> focal length Wide lens with a Wide FOV, a Wide sensor and a Wide image signal
> processor (ISP), the Wide imaging section operative to provide Wide image data
> of an object or scene; a Tele imaging section that includes a fixed focal length
> Tele lens with a Tele FOV that is narrower than the Wide FOV, a Tele sensor
> and a Tele ISP, the Tele imaging section operative to provide Tele image data
> of the object or scene; and a camera controller operatively coupled to the Wide
> and Tele imaging sections …

'291 patent, at 4:24-34. Likewise, the claims of the '291 patent also use "Wide" and "Tele" in this

manner. Claim 1 of the '291 patent recites in part as follows:

> 1. A zoom digital camera comprising:

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[2] Scarff is filed concurrently herewith as Exhibit 5 to the Declaration of James S. Tsuei. All
citations to Exhibits herein refer those attached to the Tsuei Declaration, unless otherwise noted.

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a) a Wide imaging section that includes a fixed focal length Wide lens with a Wide field of view (FOV), a Wide sensor and a Wide image signal processor (ISP), the Wide imaging section operative to provide Wide image data of an object or scene;

b) a Tele imaging section that includes a fixed focal length Tele lens with a Tele FOV that is narrower than the Wide FOV, a Tele sensor and a Tele ISP, the Tele imaging section operative to provide Tele image data of the object or scene; and …

As shown above, claim 1 uses "Wide" and "Tele" as words to denote a relationship to two different groups of components, with each group being an "imaging section," and each "imaging section" having a "lens" having a FOV that is either narrower or wider than that of the lens in the other imaging section, a "sensor," and an "image signal processor." In the context of the claims, "Wide" and "Tele" together clearly refer to a pair of imaging sections that differ with respect to the FOVs captured by their lenses.

Apple's proposals that "Wide" mean "wide-angle," fail because they would result in uncertain claim scope. Were "Wide" in the claims substituted with "wide-angle," claim 1 would require, among other things, a "wide-angle sensor" and a "wide-angle image signal processor," both of which are meaningless phrases because neither a "sensor" or "image signal processor" can have a "wide angle" in the sense of having a particular FOV or FOV within a particular range as Apple's second proposal requires. Hart Decl. ¶¶ 33-34.

Apple's second alternative proposal adds an additional requirement: "characterized by an effective focal length (EFL) shorter than normal and field of view (FOV) wider than normal." This proposal is defective because of its reliance on an undefined "normal" EFL and a "normal" FOV. Hart Decl. ¶ 36. Such concepts do not exist in the art, would not be apparent to a POSITA, and, most important, have no support or basis in the intrinsic record. *Id.* Finally, Apple's primary argument, that "Wide" be not construed at all and instead by given its plain and ordinary meaning, is inconsistent with its position that "Tele" should be construed.

While the inventions of the '291 patent may be implemented in systems where one imaging section uses a lens that could be characterized as "wide-angle," and the other uses a lens that could be characterized as "telephoto," that is not a requirement of the claims. Corephotonics implemented the invention of the '291 patent and its other patents using dual-aperture camera

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1 systems with both a wide angle and telephoto lens. But the claims are not defined by commercial

2 embodiments. Rather the claims here use the two terms "Wide" and "Tele" to refer to two-camera

3 systems in which one of the two has a wider field of view than the other, regardless of whether

4 one could be described as "wide-angle" or "telephoto." In examples where the two systems could

5 be described as "wide-angle" and "telephoto," Corephotonics has in some contexts used "Wide"

6 and "Tele" as shorthand for referring to these components of its commercial embodiments. *See,*

7 *e.g.*, Dkt. 96, at 9 (referring to "wide-angle ('Wide') and telephoto ('Tele')." Corephotonics did

8 not suggest, however, that "Wide" and "Tele" were terms to be limited by, respectively, "wide

9 angle" and "telephoto." In any event, when the claims of the '291 patent are divorced from their

10 commercial embodiments (as is proper), it is clear that "Wide" and "Tele" are coined terms as

11 explained above.

B.   "Tele" (*'291 patent, claims 1, 2, 4, 5, 10, 12, 13*)

Corephotonics' Proposed Construction	Apple's Proposed Construction
"Tele" refers to one of a pair of imaging sections with a narrower field of view	telephoto, characterized by a TTL/EFL ratio less than 1. Alternatively, in the event the Court does not adopt that construction, Apple would propose that "Tele" means "telephoto, characterized by an effective focal length (EFL) longer than normal and field of view (FOV) narrower than normal."

18   As explained above for the "Wide" term in dispute, "Wide" and "Tele" are terms used by

19 the '291 patent to refer to two separate groups of components and the relative relationship between

20 their fields of view, each group being an "imaging section," and each "imaging section" having

21 certain components such as a lens, sensor, and image signal processor. This is why Corephotonics'

22 proposal for "Tele" is correct.

23   Apple's primary proposal for "Tele," like with its arguments for "Wide," errs by seeking

24 to impose a specific structural design (i.e., a TTL/EFL<1 requirement) through "Tele." As with its

25 arguments for "Wide," Apple's position here would result in absurd claim scope. For example,

26 claim 1 would require a "telephoto [image sensor], characterized by a TTL/EFL ratio less than 1."

27 It would also require a "telephoto [image signal processor], characterized by a TTL/EFL ratio less

28 than 1." Of course, sensors and image signal processors are computer chips which do not have

1   track lengths or focal lengths, and thus it is nonsensical to speak of a sensor or an ISP meeting a

2   specific TTL/EFL ratio requirement. Hart Decl. ¶ 39.

3   Apple's proposal fails for an additional, independent reason. If Apple intends for its

4   proposal to mean that the **lens** of the Tele imaging section should have a TTL/EFL>1 (which

5   apparently is what Apple actually wants and is the only reasonable interpretation of its proposal),

6   that requirement is found in dependent claims. Claim 6 recites:

7   6. The camera of claim 1, wherein the ==Tele lens== includes a ratio of total length
         (TTL)/effective focal length (EFL) smaller than 1.

8

9   As the Court knows, "claim differentiation refers to the presumption that an independent

10   claim should not be construed as requiring a limitation added by a dependent claim." *Altera Corp.*

11   *v. PACT XPP Techs*., AG, No. 14-CV-02868-JD, 2015 WL 4999952, at *10 (N.D. Cal. Aug. 21,

12   2015) (Donato, J.) (quoting *Curtiss–Wright Flow Control Corp. v. Velan, Inc*., 438 F.3d 1374,

13   1380 (Fed. Cir. 2006)). The limitation sought by Apple here (to the extent it can be intelligibly

14   applied to the independent claims) already exists in a dependent claim. It is presumptively

15   improper to import that limitation into the independent claim. The Court should thus reject Apple's

16   effort here and find, as Corephotonics has explained, that "Wide" and "Tele" are coined adjectives

17   used in the claims to denote a certain group of components which differ at least in their respective

18   lens's FOVs.

19   Finally, Apple's alternative proposal for "Tele" fails for the same reasons that its second

20   alternative proposal for "Wide" fails: it relies on undefined concepts of "normal" FOV and

21   "normal" EFL. These are neither terms of art in the field, nor terms based any statement or teaching

22   in the intrinsic record, which makes the proposal unworkable and unhelpful. Hart Decl. ¶ 41.

         C.   "fused" / "fusion" (*'291 patent, claims 1, 12, 13*)

Corephotonics' Proposed Construction	Apple's Proposed Construction
Corephotonics proposes that these terms be construed in their full context. See Terms D ("fused output image" / "without fusion …. output images") & E ("fused output image of the object or scene from a particular point of view").	"fused": formed into a composite that includes pixels from the Wide and Tele images. "fusion": forming a composite that includes pixels from the Wide and Tele images.

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Corephotonics proposes that "fused" and "fusion" be construed in their full context and as a part of the claim language in which they appear, such as in *infra* Sections IV.D and IV.E, and thus Corephotonics hereby incorporates by reference its arguments for Terms D and E.

D.   "fused output image" / "without fusion … output images" ('*291 patent, claims 1, 12, 13*)

Corephotonics' Proposed Construction	Apple's Proposed Construction
"fused output image" means "output image including a combination of image information from two images" "without fusion … output images" means "output images not created by combining image information from two images"	"fused output image": a composite output image that includes pixels from the Wide and Tele images. "without fusion . . . output images": output images that do not include a composite image that includes pixels from the Wide and Tele images.

The parties' core dispute over the "fusion" terms (including Terms C, D and E) is whether the concept of fusion requires producing an output image which "includes pixels from" two input images. For this Term, the parties otherwise largely agree on the remaining issues presented in the competing proposals: i.e., fusion requires producing an "output image" that is either a "combination" of or "composite" of image data from two other images (with "combination" being Corephotonics' preferred term, which is also sourced from the claim language). Apple's position deviates from the context of the '291 patent and relies on three principal errors. Hart Decl. ¶ 43.

First, Apple's proposals improperly narrow the general term "fusion" to a specific type of fusion in which some of the "pixels" of one image are replaced with "pixels" from another image. "Fusion" as used by those skilled in the art and within the '291 patent is not so limited. Apple improperly seeks to limit the genus term "fusion" to one particular species of fusion. *Id.* ¶ 44. Apple's proposal contradicts the ordinary meaning of "fusion" and the '291 patent's technical teachings, which contain no statements of disclaimer or disavowal of the term's ordinary meaning. The claims and specification of the '291 patent convey no pixel-inclusion requirement as Apple's proposal would import. "Fusion" simply requires, as Corephotonics proposal conveys, combining information from two images. The concept of "fusion" may ***include*** the combination of pixels (as was disclosed in the prior art cited by the '291 patent), but a POSITA would not understand fusion to be ***limited*** in that way. *Id.*

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As prior art cited by the '291 patent discusses, the concept of "fusion" in digital image processing plainly encompasses techniques that do not combine pixels from two images, such as extracting color information (as opposed to actual pixels) from one image and combining it with another, grayscale, image. *Id.* ¶ 45. U.S. Patent App. Pub. 2012/0026366 to Golan et al. ("Golan '366") (Ex. 4) [3] teaches (among other thing) a method of fusion where the color data extracted from a color image (and not the pixels of said image) are used to modify the pixels of another, grayscale image:

> When image sensor selector 750 closes contact 754, both monochrome image sensor 610 and color image sensor 612 are in operation, whereas image frames are acquired by monochrome image sensor 610 and color of image sensor 612, synchronously. Fusion module 660 extracts the color information from color image frame 632 and fuses the extracted color information with monochrome image frame 630 to form a high resolution, colored image frame 650. The fusion includes computing color values for the high resolution pixels of monochrome image frame 630 from the respective low resolution color image frame 632. Preferably, the computation and alignment of the color values is performed in sub pixel accuracy.
>
> In some variations of the present invention, the output colored image frame 650 is provided with RGB information. In other variations of the present invention, fusion module 760 transmits the Y information, obtained from monochrome image sensor 610 covered with color (Cr, Cb) information obtained from color image sensor 612. The color information obtained from color image sensor 612 via a color space. Then, fusion module 760 merges the Y information, obtained from monochrome image sensor 610, and the color (Cr, Cb) information. Then, color space conversion module 770 converts the image back to an RGB color space, creating colored output image frame 650.

Golan '366, at [0067]-[0068]. What Golan '366 teaches is a way of taking the color information from a color image using it to color-in the pixels of a grayscale image. Hart Decl. ¶ 45. This, too, is "fusion" within the meaning of the art and the general knowledge of a POSITA, but does not involve replacing pixels from one image with pixels from another image.

Similarly, WO2015/015383, titled "Thin Multi-Aperture Imaging System with Auto-Focus and Methods for Using Same" ("Shabtay '383") (Ex. 6)[4] and assigned to Shabtay, Cohen, Goldenberg, and Gigushinski—the same named inventors as on the '291 patent—teaches several

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[3] Golan '366 was cited by the Examiner to the applicant in a Notice of References Cited dated September 25, 2015. Ex. 2.

[4] Shabtay '383 was disclosed to the Examiner during the prosecution in an April 13, 2015 Information Disclosure Statement. Ex. 1.

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1   techniques described therein as "fusion," but which would be excluded by Apple's proposal. Hart

2   Decl. ¶ 46. For example, Shabtay '383 teaches a technique of taking two images, each with a given

3   resolution, and then feeding those images into an "image fusion algorithm" to produce an image

4   with a greater resolution than either of the input images:

5   A digital image processing algorithm combines the two images into one image,
6   in a process called "image fusion". Henceforth, the algorithm performing this
           process is called "image fusion algorithm". The resulting image may have a
7   higher resolution (in terms of image pixels) and/or a higher "effective
           resolution" (in terms of the ability to resolve spatial frequencies in the scene,
8   higher "effective resolution" meaning the ability to resolve higher spatial
           frequencies) and/ or a higher SNR than that of one sub-camera image.

9   In terms of resolution and exemplarily, if each sub-camera produces a 5
10   megapixel (2592x1944 pixels) image, the image fusion algorithm may combine
           the two images to produce one image with 8 megapixel (3264x2448 pixels)
11   resolution.

12   Shabtay '383 at 9:9-18. The resulting output image from Shabtay '383's image fusion algorithm

13   contains no "pixels" at all from either image – rather, what is being done is that each pixel of the

14   output image is created anew and probabilistically determined based on data from both of the input

15   images. Hart Decl. ¶ 46. The result is an output image that has a greater resolution than that of

16   either of the input images. This, too, is "fusion" within the art.

17   Golan '366 and Shabtay '383's discussions plainly demonstrate that "fusion" has a plain

18   and ordinary meaning within the art that is broader than what Apple has proposed. That prior art

19   of record shows that "fusion" includes at least techniques which (1) involve combining image

20   information like values from images' color channels, and (2) using image data from two images

21   to create an entirely new image. Both, however, would be excluded by Apple's proposal to narrow

22   "fusion" to necessarily require the ***combination of pixels***. *Id.* ¶ 47. As no statements of disclaimer

23   or disavowal exist here that would support limiting "fusion" in such a way, Apple's proposal is

24   improper and should be rejected.

25   The specification further reflects an understanding of "fusion" to be more than simply the

26   combination or composite of ***pixels*** from two images. The patentees knew and used the words

27   "fusion" and "pixel"—those and closely related words (e.g., "fused," "pixel," "pixelated") are used

28   throughout the specification and the claims themselves. But when discussing the concept of fusion,

1   the patentees made clear that "fusion" referred to the combination of image **information**. *See, e.g.*,

2   '291 patent at 3:34-38 ("In still mode, zoom is achieved "with fusion" (full or partial), by fusing

3   W and T images, with the resulting fused image including always **information** from both W and

4   T images."). Hart Decl. ¶ 48.

5   Apple's proposed construction would also improperly exclude a preferred embodiment

6   described in the patent specification. An embodiment shown in the patent discloses a "fusion"

7   technique in which the output image does not include any pixels from one of the two input images

8   – directly contrary to Apple's proposed construction. Figure 5 "shows an embodiment of a method

9   disclosed herein for acquiring a zoom image in still mode." '291 patent, at 9:15-16. The

10   embodiment is directed to an image fusion technique which uses image registration and resampling

11   techniques to mitigate the effect of dissimilarities that two images of a given scene or object might

12   have due to the spatial offset between the two cameras that captured the images. Hart Decl. ¶ 49.

13   Figure 5 (excerpted and annotated) shows:
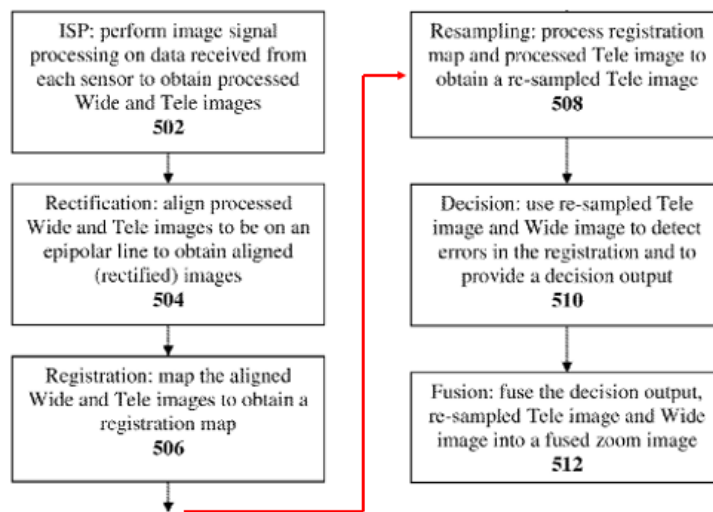
22   The specification goes on:

24   the re-sampled Tele image and the Wide image are processed to detect errors in
         the registration and to provide a decision output. In more detail, in step 510, the
25   re-sampled Tele image data is compared with the Wide image data and if the
         comparison detects significant dissimilarities, an error is indicated. ***In this case,***
26   ***the Wide pixel values are chosen to be used in the output image.*** **Then, in**
         fusion step 512, the decision output, re-sampled Tele image and the Wide
27   **image are fused into a single zoom image.**

COREPHOTONICS' OPENING CLAIM CONSTRUCTION BRIEF

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'291 patent, at 9:27-36. The "output image" contemplated by Figure 5's Step 512 has only "pixels" from the Wide image, whereas the Tele image is resampled before data deriving from resulting resampled image is fused with pixels of the Wide image. It has no "pixels" from the Tele image. Thus, Apple's proposal, which requires that the fused output image include pixels from ***both*** "Wide" and "Tele" images, would improperly exclude the patent's Figure 5 embodiment. *See Anchor Wall Sys. v. Rockwood Retaining Walls, Inc.*, 340 F.3d 1298, 1308 (Fed. Cir. 2003) (claim construction excluding a preferred embodiment "would require highly persuasive evidentiary support").

Where the patentees intended for an output image produced by image fusion to have the ***pixels*** of one input image or another, ***they said so***. That also means the patentees did not use the term "fusion" to mean ***only*** a technique which involved combining the pixels of inputs. Instead, the patentees used "fusion" according to its broader ordinary meaning consistent with the prior art of record and general knowledge of a POSITA. Hart Decl. ¶¶ 50-51.

Second, both of Apple's proposals improperly insert the word "composite" into the construction. The word "composite" neither adds clarity nor appears to impose any additional material limitation on claim scope. The claims already require that image data from Tele and Wide cameras be "***combined*** … to provide a fused output image." '291 patent, cl. 1(c). Supplementing the claim meaning with a new word, "composite," produces no clarity on its face and, to the contrary, injects ambiguity into claim scope by suggesting to a fact finder that there is a material difference, otherwise unexplained, between the meaning of the word "composite" and the claim's existing requirement that image data be "combined." *Id.* ¶ 52.

Third, both of Apple's proposals include "Wide" and "Tele." This is problematic for obvious reasons. "Wide" and "Tele" terms are disputed terms whose ultimate construction by the Court impacts the meaning and scope of Apple's proposed construction for the two "fusion" phrases in Term D. Apple's proposals for "Wide" and "Tele" are wrong for the reasons already described, and if they are accepted and applied here (in recursive fashion) to Apple's proposal for Term D, they would result in nonsensical phrases. For example, the claim phrase "Tele image(s)" would be transformed, under Apple's positions, into either (a) "telephoto images characterized by

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1   a TTL/EFL ratio less than 1" or (b) "images characterized by an effective focal length (EFL) longer

2   than normal and field of view (FOV) narrower than normal." But it makes no sense to say an

3   "image" is "characterized by a TTL/EFL ratio less than 1" or "characterized by an effective focal

4   length." An image might be **captured** by a camera with a TTL and a lens that has a particular EFL

5   or which produces a particular FOV, but the camera's TTL, EFL and FOV are not characteristics

6   of an "image." *Id.* ¶ 53.

7   Further, Apple's injection of "Wide" and "Tele" results in a redundancy: the claim

8   language of the '291 patent already specifies that an "output image" is the result of combining "at

9   least some of the Wide and Tele image data." *Id.* ¶ 54. To illustrate, claim 1(c) of the '291 patent

10   recites "a camera controller operatively coupled to the Wide and Tele imaging sections, the camera

11   controller configured to combine in still mode at least some of the Wide and Tele image data to

12   provide a fused output image." '291 patent, cl. 1. Apple also contends "image data" should be

13   limited to data that "represents pixels," Apple's proposals for Term D result in repetitive and

14   unwieldly claim language. For example, claim 1(c) would be transformed like so:

15   c) a camera controller operatively coupled to the Wide and Tele imaging
         sections, the camera controller configured to combine in still mode at least some
16   of the ==*Wide*== and ==*Tele*== [*data that represents image pixels*] to *provide* [*a composite
         output image that includes pixels from the Wide and Tele images*] of the object
17   or scene from a particular point of view and to provide [*output images that do
         not include a composite image that includes pixels from the Wide and Tele
18   images*] of the object or scene, each output image having a respective output
         resolution;
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20   Apple's proposals are deficient for multiple reasons, including in that they exclude a

21   preferred embodiment, are inconsistent with the intrinsic record, and are unsupported by any

22   statements of disclaimer or disavowal. Moreover, Apple previously admitted, in IPR proceedings

23   applying the same *Phillips* claim construction standard, that the proper construction of fusion

24   involved combining **information** from two images, not combining pixels from two images. Ex.

25   7, at ==__.== Apple's new, narrower proposals here in District Court, made under the same *Phillips*

26   standard as its IPR proposal, are suspect and plainly motivated by its litigation goals. When Apple

27   was challenging validity, it advocated for a broader construction, now, having failed, it changes

28   position and advocates for a narrower construction. Because Corephotonics' proposal captures the

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meaning of the terms according to their ordinary meaning and as used in the intrinsic record, it

should be adopted by the Court.

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E. "fused output image of the object or scene from a particular point of view" (*'291 patent, claims 1, 12*)

Corephotonics' Proposed Construction	Apple's Proposed Construction
"output image of the object or scene from a particular point of view" means that "the object and scenes of the output image have the position and shape as would be seen from a defined point of view of one of the Wide or Tele lens" "a fused output image of an object or scene from a particular point of view" means "a composite / output image that if from the Wide POV combines Wide image data with image data from the overlap region of the Tele image, and if from the Tele POV, combines Tele image data with image data from the overlap region of the Wide image"	"a fused output image of an object or scene from a particular point of view" means an output image of an object or scene that is always a composite of both Wide and Tele image pixels, whether from the Wide or Tele point of view. "an output image of an object or scene that is always a composite of both Wide and Tele image pixels, whether from the Wide or Tele point of view" "output image of the object or scene from a particular point of view" – no separate construction is necessary. If the Court determines that construction is necessary, "output image of the object or scene from a particular point of view" means an output image of the object or scene from the Wide or Tele point of view.

First, the parties' dispute in Term E includes whether a "fused output image" is an output

image "of an object or scene that is always a composite of both Wide and Tele image pixels." The

core of the parties' dispute as to this portion of Term E is whether "fusion" (and "fused output

image") is something which necessarily or ("always") requires a combination or composite of

"pixels" from multiple other images. This issue is addressed in detail above in Corephotonics'

discussion for Term D and thus is incorporated by reference herein.

Second, the remainder of the parties' dispute for Term E concerns whether the claim

language "particular point of view" should impact the claim scope. Apple proposes no separate

construction and provides no argument about what "particular point of view" means. Thus, like

with Apple's proposal for this term in 2018, Apple's proposed construction fails to explain what

is meant by an output image of the object or scene "from a *particular point of view*."

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1   Unlike Apple's, Corephotonics' proposed construction is informed by the '291 patent's

2 definition point of view (POV). Following from the foregoing description of the '291 patent in §

3 II.B, the relevant "point of view" of the camera is determined by position and shape of objects and

4 scenes that the camera captures:

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> In a dual-aperture camera image plane, as seen by each sub-camera (and respective image sensor), a given object will be shifted and have different perspective (shape). This is referred to as point-of-view (POV). **The system output image can have the shape and position of either sub-camera image or the shape or position of a combination thereof.** If the output image retains the Wide image shape then it has the Wide perspective POV. If it retains the Wide camera position then it has the Wide position POV. The same applies for Tele images position and perspective.

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'291 pat., 4:60-5:2 (emphasis added). The specification also teaches:

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> In order to reach optical zoom capabilities, a different magnification image of the same scene is captured (grabbed) by each camera sub-camera, resulting in FOV overlap between the two sub-cameras. Processing is applied on the two images to fuse and output one fused image in still mode. The fused image is processed according to a user zoom factor request. As part of the fusion procedure, up-sampling may be applied on one or both of the grabbed images to scale it to the image grabbed by the Tele sub-camera or to a scale defined by the user. The fusion or up-sampling may be applied to only some of the pixels of a sensor. Down-sampling can be performed as well if the output resolution is smaller than the sensor resolution.

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16 The specification of the '291 patent goes on to teach methods for generating fused output images

17 with a (single) particular, consistent POV from the information in the Wide and Tele camera

18 images. *See id.*, 5:5-10, 9:15-36, Fig. 5. Corephotonics' proposal captures this particular context

19 by providing clarification which Apple does not appear to dispute: that an output image with one

20 camera's "point of view" is created using image data from the overlap region in the image

21 produced by the other camera. Hart Decl. ¶¶ 59-60. Apple also does not appear to dispute that for

22 an image to have a particular "point of view" means that the "the object and scenes of the output

23 image have the position and shape as would be seen from a defined point of view" of the lens of a

24 specific imaging section.

25   Apple's proposal fails to address the potential dispute between the parties over the meaning

26 of "particular point of view." *See O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d

27 1351, 1360 (Fed. Cir. 2008) (holding that when the parties raise an actual dispute regarding the

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proper scope of these claims, the court, not the jury, must resolve that dispute). Corephotonics'
proposed construction for this term, therefore, should be adopted.

F. "image data" ('291 patent, claims 1, 2, 12)

Corephotonics' Proposed Construction	Apple's Proposed Construction
plain and ordinary meaning, or, in the alternative if the Court determines a construction is necessary, "data output from an imaging section"	data that represents image pixels.

The parties dispute here centers on whether "image data" in the context of the claims must
be data that "represents image pixels," or whether it may include data that does not "represent"
specific pixels but instead reflects other image-related data such that reflecting the luminance or
intensity of an image, both of which a POSITA would understand the plain and ordinary meaning
of this term to include. As Apple identifies no statements of disclaimer or disavowal from the
intrinsic record that would support limiting "image data" in the way they desire, its proposal should
be rejected and this term should be accorded its full plain and ordinary meaning.

As an initial matter, Apple's proposal is defective because it is vague. It is unclear what
Apple means for data to "represent" pixels. It is unclear, for example, whether luminosity and
intensity data – examples of information used in fusion in the specification – constitute "data which
represents image pixels" under Apple's proposal. Hart Decl. ¶ 62.

Further, the intrinsic record is clear that "image data" is not limited to simply data that
"represents" pixels, and that this is a plain and ordinary meaning existing as matter of convention
followed by person of skill in the art. As just one example, U.S. Patent App. Pub. 2011/0064327
to Dagher et al. ("Dagher") is cited and discussed in the '291 patent as an example of existing
"[m]ulti-aperture imaging systems." *See* '291 patent, at 2:1-3; Hart Decl. ¶ 63. Dagher is directed
to a system and method for "image data fusion" based on first and second sets of image data. *See*
Dagher, at Abstract. Dagher shows that the phrase "image data" is not limited to data representing
individual RGB values in an array of pixels, but that it also refers to a given image's luminosity
(based on an image's luminosity channel) and intensity information:

> In another aspect, the first collection of overlap image data may include a first
> collection of luminance data, and the selected one of the image data subsets may

be a luminance channel (of luminance data) based on luminance as the characteristic of the second collection of overlap image data, and changing of the first collection of overlap image data may include combining the first and second collections of luminance data….

In an additional aspect, the second collection of overlap image data may include intensity information, and scaling the second collection of overlap image data may include changing at least some of the intensity information. In this case scaling the second collection of overlap image data includes applying a gain for causing the changing of the intensity information.

Dagher, at [0009] & [0011].

Moreover, it is commonly known in the art that an "image," even a "digital image," need not be a rectangular matrix of pixels or have any "pixels" at all in any sense of the term. Hart Decl. ¶¶ 63-64. In today's usage, many (or even most) digital images begin their existences as digital data in a "raw" format, which is in most cases a standard bitmap assigning RGB values to cells in a mathematical matrix and which can be interpreted by software to display an image. *Id.* Images in this class are called "raster" images. *Id.* However, many digital images do not rely on bitmaps and pixels at all but instead are rendered from mathematical statements that define lines and other geometric shapes on a Cartesian plane and, often, also contain instructions on which bounded areas on the plane (those boundaries being defined by the geometric shapes) are filled in with which colors. This is the "vector" class of digital images, and at a basic level not unlike how a graphing calculator is able to draw geometric shapes and sinusoid curves based on an equation inputs. Because vector images do not have "pixel" data at all (and nor would a POSITA believe they do), Apple's proposal here improperly narrows the term "image data" by narrowing the term to exclude non-raster images such as vector images for which "pixels" do not exist. *Id.* No statements of disclaimer or disavowal exist here that would support limiting "image data" in such a way.

G.   "lens assembly" (*'712 patent, claims 1, 12, 13, 15, 16, 19*)

Corephotonics' Proposed Construction	Apple's Proposed Construction
Plain and ordinary meaning, or, in the alternative if the Court determines that a construction is necessary, "arrangement of optical lens elements"	a five lens element optical lens assembly. Alternatively, "lens assembly" means "a self-contained operational unit of five optical lens elements," or alternatively "a lens limited to five elements."

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The parties' dispute over "lens assembly" centers around whether the term "lens assembly" should import extraneous limitations that are not part of the meaning of that term – specifically to be narrowly defined by the Court to be a "lens assembly" with "five optical lenses." The claim language and intrinsic evidence of the '712 patent make clear it should not. Indeed, Apple largely agrees that the term "lens assembly" needs no construction. Its preferred construction simply appends five additional words—"a five lens element optical"—to the phrase "lens assembly." Similarly, its two alternative proposals also impose a five-element limitation on "lens assembly" and do not add anything else other than, in the case of Apple's first alternative proposal, to specify that an "assembly" must be a "self-contained operational unit."

But, as Apple must concede, the phrase "lens assembly" by itself does require a specific number of lens elements. Hart Decl. ¶¶ 67-69. Neither do any clear and unambiguous statements of disclaimer, disavowal, or definition appear in the intrinsic record indicating the phrase "lens assembly" means only those lens assemblies with five elements. In fact, the specification refers to lens assemblies with more or fewer elements. *See, e.g.,* '712 patent, at 1:32-34 (four lens elements). Likewise, the during prosecution the applicant cited numerous publications referring to lens assemblies with varying numbers of lens elements, without an implication that the drafted claims' use of that term should be limited in the way Apple suggests. *See, e.g.*, U.S. Patent No. 5,946,142 (six-lens assembly cited in 1/8/2017 IDS) (Ex. 8); U.S. Patent App. Pub. 2007/0229987 (three-lens assembly cited in 1/8/2017 IDS) (Ex. 9).

To the extent claims of the '712 patent do require a particular number of elements that requirement is separately claimed and not a part of the term "lens assembly." For example, claim 1 requires a "lens assembly, comprising: a ***plurality*** of refractive lens elements." The claim does not require "five refractive elements" or a "lens assembly" which is "limited to five refractive lens elements." Claim 1 then subsequently requires that the claimed "lens assembly" comprise "a first lens element," "a second lens element," and "a third lens element," but does not claim, for example, a "fourth" or "fifth" lens element. Thus, claim 1's "lens assembly" must comprise at least three lens elements and may be practiced with a lens assembly with three elements. Hart Decl. ¶ 70.

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1   Notwithstanding claim 1, *other* claims of the '712 patent *do* specify fourth and/or fifth lens

2   elements being a part of the "lens assembly." Claim 2, for example, depends from claim 1 and

3   further requires that the "plurality of lens elements ***further comprises*** a fourth lens element." And

4   claim 4, depending from claim 2, further adds a "fifth lens element" requirement to the claimed

5   "plurality of lens elements." The structure and ordering of these claims is unambiguous evidence

6   of a decision by the drafter to claim, in the independent claims, a lens assembly with at least three

7   lens elements, and to locate requirements for a "fourth" and "fifth" lens to the dependent claims.

8   The drafter did not intend the phrase "lens assembly" to take on a specific "five element"

9   requirement as Apple proposes, nor would a POSITA understand it to include these additional

10   requirements simply due to how the patent claims are arranged. Hart. ¶ 71. And if the Court deems

11   it necessary to construe this term, only Corephotonics' proposal faithfully reflects the intrinsic

12   record: "arrangement of optical lens elements."

13   Finally, as for Apple's alternative proposal adding "a self-contained operational unit" as a

14   requirement, Corephotonics is aware of no intrinsic or extrinsic evidence supporting such a

15   construction. The phrase "self-contained operational unit" is vague and subject to competing

16   interpretations. Hart. ¶ 74. If Apple provides arguments clarifying its position, Corephotonics will

17   respond in due course.

18   **V.   CONCLUSION**

19   For the foregoing reasons, Corephotonics respectfully requests that the Court adopt its

20   proposed constructions of the disputed claim terms.

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Respectfully submitted,

RUSS AUGUST & KABAT

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CERTIFICATE OF SERVICE

I certify that counsel of record who are deemed to have consented to electronic service are being served on September 29, 2022, with a copy of this document via the Court's CM/ECF systems per Local Rule CV-5(a)(3). Any other counsel will be served by electronic mail, facsimile, overnight delivery and/or First Class Mail on this date.

/s/ James S. Tsuei